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ABSTRACT

Advance organizers are used to teach specific contexts with different levels of complexity. Regardless of the educational level or context, the advance organizer (graphic organizer) is a tool that helps the learner connect the "known" to the "unknown" and remember the knowledge gained. To help in understanding this process, a case study was developed based on higher education faculty and undergraduate and graduate students' opinions on the value and usefulness of graphic organizers to connect visual language with verbal language in order to optimize active learning. Five faculty members and 17 students, both graduate and undergraduate, responded to questions about graphic organizers. Students appreciated the value of the graphic organizer and recognized the connection with prior knowledge and usefulness as a teaching strategy. Faculty members also found graphic organizers to be valuable teaching tools, and they acknowledged the value of graphic organizers in helping teacher candidates develop higher level critical thinking skills. (SLD)

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Engaging minds, Enhancing Comprehension and Constructing Knowledge Through Visual Representations

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Engaging Minds, Enhancing Comprehension and Constructing Knowledge Through Visual Representations

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Abstract

The advance organizers are used to teach specific contents with different levels of complexity. A primary, secondary, or higher education classroom looks similar when a graphic organizer is being utilized. In fact, regardless of the educational level and context, it is a tool that helps the learner connect the "known" to the "unknown" and remember the knowledge gained. The individual, regardless of age, academic experiences, content exposure, cultural background, school context, when fed with new data, retrieves what he/she already knows. In understanding this process, a case study was developed based on higher education faculty and undergraduate and graduate students' opinions on the value and usefulness of graphic organizers to connect visual language with verbal language in order to optimize active learning.

Key Words: graphic organizers, advance organizers, visual representations, schema, organizational patterns, text structure

Scholars, such as Piaget and John Dewey often stressed the importance of students being actively engaged in their own learning. Piaget stated that knowledge came from action; Dewey's philosophy focused on the necessity for active, involved learning by the students.

Research has indicated that the majority of students are visual learners; therefore, it is evident that graphic organizers are effective learning tools (diagrams, semantic maps or webs) that aid students in learning new concepts and understanding existing ones. Graphic organizers, according to researchers, have been determined to be some of most effective instructional strategies when teaching comprehension [Bos. Anders, Filip, and Jaffe, 1985]. They have also been determined to be effective in teaching vocabulary development [Toms-Bronowski, 1983].

Advance organizers also called graphic organizers or visual representations have long been used as instructional aids. Teachers report these aids help students organize their knowledge, encourage divergent thinking, and stimulate higher order thinking skills. For students with low verbal abilities, graphic organizers are spatial/visual tools that help them arrange ideas and connect to the content. An advance organizer engages students' visual intelligence, stretches their thinking, and promotes active learning. It helps present the key concepts in a more organized manner and encourages students to become actively engaged during the discussion of key concepts. When students see how to arrange knowledge in an organized, systematic pattern, it provides them with an effective process for learning and storing information

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in their schemata. Educators also report that these graphic representations help students as they apply, analyze, synthesize, and evaluate new knowledge. In addition, graphic organizers help students learn, link and transfer concepts. Therefore, these tools have become increasingly effective in the classroom.

There are specific reasons why teachers should use advance organizers in the classroom. First, the enhancement, expansion, and promotion of higher order thinking skills. These thinking skills are: analyzing, synthesizing, evaluating, categorizing, sequencing, relating, conceptualizing, comparing and contrasting. Secondly, better comprehension and understanding of complex learning materials and concepts. When using a graphic organizer, students are able to make connections with prior knowledge and new knowledge they are acquiring to increase learning. Thirdly, long-term retention of information is facilitated by the use of organizers.

Theoretical Base

There are cognitive agreements, which indicate that humans process two types of knowledge: declarative and procedural [Anderson, 1983; Bigge & Shermis, 1999; Jonassen, Beissner, & Yacci, 1993]. Declarative knowledge is "knowing that" something is the case, is verbalizable knowledge about the world. An example of this knowledge: *We know that chromosomes X and Y are responsible for deciding the gender of the individual.* The definitions of constructs, the identification of facts, numbers, colors, are examples of declarative knowledge. On the other hand, procedural knowledge is "knowing how" to perform a task. An example of procedural knowledge: *We know how to ride a bike*. Knowing how to manipulate computer software, or adding, subtracting, multiplying, or dividing three-digit numbers are examples of procedural knowledge.

Understanding how procedural and declarative knowledge interact intrinsically in order to mentally organize knowledge is key to the planning of the teaching and learning process. The practical command of procedural knowledge makes it dependent on the declarative knowledge. If declarative knowledge or knowledge base exists, then the procedural knowledge is executed. Now, the procedural knowledge demands more complex forms than the declarative knowledge. It is a higher thinking order process requiring comprehension, application, and analysis. In order to produce this transition, from declarative to procedural, many educational psychologists have proposed a knowledge bridge between both. The facts and concepts learned as declarative knowledge are interrelated with one another to form complex knowledge [Ritchie & Gimenez, 1995]. That bridge is called structural knowledge. It allows the student to mentally organize the declarative knowledge, which is transferred to procedural knowledge [Diekhoff, 1983].

The mesh of mental connections of declarative knowledge or structural knowledge is associated with independent ideas. If students develop these structures, they should then be able to draw conclusions, infer and predict, and overall, understand the relationships among ideas. It is to say, a process that emerges which intends to reframe the knowing "what" to knowing "why." The webbing of ideas created by the structural knowledge supports the development of procedural knowledge [Ritchie & Gimenez, 1995]. It is here where advance or graphic organizers fit. It is a method that seeks relationships, interconnections among concepts in a node—link—visual display [Anderson, 1990; Jonassen, 1990; Jonassen et al., 1993].

The graphic organizers, or visual representations or visual maps, are learning tools used for teaching different theoretical contents. They support the long-term memory process as the information enters into it through the working memory. While information must be repeated or rehearsed to stay in working memory, storing the information after being elaborated, classified, organized, connected, is a process owned by the long-term memory. When using graphic organizers, old information is retrieved and linked to new information in order to facilitate the comprehension of new knowledge. Organizing the data graphically aids students in their attempts to establish relevant connections regarding the acquisition of knowledge. This process is a primary teaching and learning goal.

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Types of Graphic Organizers

The knowledge organizers can be presented in six different patterns: *hierarchical*, *conceptual*, *sequential*, *evaluative*, *relational*, and *cyclical*. When a faculty member selects any visual representation, she bases her selection on the curriculum content to be taught. In higher education, for example, informational expository texts are commonly used. The structure that informational expository texts exhibit is as varied as their purposes and fields of knowledge. Some of the common structures used in organizing expository text are:

Description or simple listing: a listing of items, ideas, or attributes where the order or presentation is not significant.

Time/temporal sequence: a sequential relationship between ideas and events reflecting the passage of time.

Definition and example: a definition of a key word or concept followed by an example.

Comparison and contrast: a description of the similarities and differences between two or more things.

Cause and effect: an interaction between at least two ideas or events, one considered a cause and the other an effect, or result.

Problem solution: an interaction between at least two factors, one citing a problem and the other a solution to that problem.

In selecting an advance organizer (1) the complexity of the text should be considered, (2) the organizer should fit the curriculum content, and (3) the structural pattern of the text should agree with the organizer selected. The following chart is an attempt to demonstrate what type of organizer best fits the structural patterns of the informational texts. See Table 1.

Table 1

Graphic Organizer Pattern	Organizational Pattern of Text
Hierarchical	Categories and subcategories, matrix, plot, tree, pyramid
Conceptual	Description, collection, mind map, word web, concept map, comparison/contrast, concept charts, senses chart, KWL
Sequential	Time line, cause/effect, chronology, process/product, problem/solution, cycle graph, line graphs, ladder, chains
Evaluative	Agreement scales, satisfaction scales, evaluation charts (PMI chart)
Relational	Cause/effect, fishbone, target, pie chart, characteristic chart
Cyclical	Cycle graph, life cycle, repetitive events

The other aspect of the use of graphic organizers is to connect the type of knowledge they intend to address in the students reasoning, either declarative (knowledge about things) or procedural (knowledge

about how to do things), with the common patterns of the expository texts. The following table 2 makes an attempt to visually represent this relationship:

Table 2

Type of Knowledge	Common Organizational Patterns
Declarative	Description, Simple listing, Definitions, Examples, Comparison and Contrast, Cause and Effect
Procedural	Time/Temporal Sequence, Problem Solution

In discussing graphic organizers and their relationships with the common organizational patterns of informational texts and the declarative and procedural knowledge and the instructional procedures that are appropriate to each, we have to keep in mind how teaching would be enhanced. The infusion of graphic organizers in the daily teaching activities help both teachers and students to prepare new information for integration with known information and for storage in the long-term memory. Balancing out the semantic memory (declarative and procedural) in teaching would reinforce the comprehension level and the acquisition and development of higher order level skills.

Development of the Case Study

Both authors of this paper are faculty members of a state-funded institution in the United States of America, Departments of Teaching Education and Educational Leadership, and they conducted a study in the use of graphic organizers within the context of higher education classrooms. Faculty members and students, from both undergraduate and graduate programs, were surveyed regarding the value and usefulness of graphic organizers. A total of seventeen students responded to the following two questions:

1. How do the graphic organizers help you process theoretical concepts in class discussions and/or knowledge acquisition and content delivery?
2. How much prior information are you able to recall and relate with the use of graphic organizers?

The five faculty members surveyed are a cross representation of interdepartments within the College of Education. They responded to the following two questions:

1. How often and what pedagogical value do you see in using graphic organizers?
2. How do graphic organizers help your students in developing advance thinking skills?

Thematic Description of Students' Responses

Students' responses to question one were categorized within the following themes:

Processing of concepts

- *Graphic organizers helped me process the concept in an organized and critical thinking matter.*
- *Graphic organizers are a great way of organizing information and increasing the ability to make inferences and think critically about a topic. I think it is more important to find the right organizer for the right topic,*
- *Graphic organizers are essential to cleaning up misconceptions about topics we are studying. They help organizer thoughts, and make it easier to understand complicated ideas.*

Connection with prior knowledge

- *It is something that actually helps activate the thinking process. I thought it better helped me understand the multiple definitions of " learning" It helped to grasp the concept of learning; to build on the meaning of learning. It triggered our schemata because certain words triggered our mental files to pull knowledge that we already had about learning.*
- *It forced me to think of what I already knew about learning. It helped me to think of questions I wanted answered and things I want to learn about learning. It helped me to learn because I was listening for the answers to my questions.*
- *Helped me to organize what I already knew, what I wanted to learn. It helped to focus of what I needed to learn and in relating prior knowledge with new knowledge.*
- *Graphic organizers are always helpful when trying to make connections in information.*

Addressing individual needs

- *It meets the needs of more learners. We all learn in different ways. Some of us are more visual and graphic organizers especially help these types of students.*
- *I am a visual learner and found that the graphic organizers clarify what I just read.*
- *It meets the needs of more learners. We all learn in different ways. Some of us are more visuals, and graphic organizers help this type of students.*

As a teaching strategy

- *It reminds teachers what is necessary in planning their lesson plans.*
- *It had me realize that children learn best when their new knowledge is associated with the previous of background knowledge. It is an effective student-centered organizer or planner to employ in the teaching approach. It helps the teacher to identify the current knowledge of students.*

Not for every student

- *Graphic organizers can sometimes be hard to understand if there is not a good text explanation to accompany them. When there is a balance of text and the organizer the information presented can be clearly understood.*
- *Typically, I do not find graphic organizers to be as useful as other learning methods. I am a "word" person and learn new and difficult concepts via discussion and paraphrasing. Thus, I would not consider graphic organizers to be particularly instrumental in my successful understanding of textual material.*

Students' responses to question two were categorized as follows:

Recalling information

- *Certain words or ideas triggered other previous knowledge about the concept of learning I already knew.*
- *I was able to recall more information that I though I remembered. It also helped me in learning new information, by making me alert of unknown ideas.*
- *When we talked about what we wanted to learn I also remember information that I had in my memory.*

Relating information

- *I feel like I knew a lot once others shared what they knew about learning and I gained new perspectives and ideas about concepts that I didn't know about from other classes.*
- *I was more focused on my learning (on what I required to know).*

- *The information in the " what did I want to know" was also more than I expected because as I write down the questions I dive deeper into the theme or subject matter to examine if there is more that I would like to know.*
- *I was able to relate a great deal of past information because I had to remember from other classes, lectures, and personal experiences. I was able to recall information that I thought I had forgotten.*

Thematic Description of Faculty' Responses

Pedagogical Value

- *I use graphic organizers to introduce conceptual frameworks. Give students the opportunity to represent their thinking and show relationships among concepts and ideas.*
- *Graphic organizers permit one to capture extensive amount of information in a small space while illustrating relationships among concepts, ideas, and information. Further, graphic organizers permit me to evaluate the degree to which students can express their understanding of the depth and breadth of the course content.*
- *Provide teacher candidates with strategies to meet the needs of all learners.*

Advance thinking skills

- *Teacher candidates develop higher-level critical thinking skills by building on knowledge and comprehension. Teacher candidates learn to apply, analyze, and synthesize their information. In this way, they may teach their future students to think at high-levels of critical thinking beyond pure knowledge.*
- *Students move through a continuum in using graphic organizers within a course, or even within a class. Students initially represent the basic knowledge: comprehension level on Bloom's taxonomy, if you will. As students gain deeper understandings about the relationships among course content, they are able to represent deeper levels of understanding by expanding their visual representations. Further, given the limited space within which students must work, they are required to synthesize discreet pieces of information into larger chunks. Typically, these represent major concepts, ideas, precepts, or themes. Finally, students evaluate their decisions and modify their graphic organizers (visual representations) as they gain new knowledge or clarify their thinking. Graphic organizers are useful for independent or group work.*

Teaching would also be enhanced with graphic organizers by making inconsiderate text more considerate. A graphic organizer would facilitate breaking down the content, using cognitive and metacognitive strategies to approach the text, organizing the text according to its patterns, and classifying essential and nonessential information. These necessary tools would make the inconsiderate text more manageable, moldable, relevant, and more understandable; in other words, more considerate.

For students to successfully construct meaning and for teachers to effectively and productively obtain higher achievements and higher levels of knowledge from students, it would be important to know what the particular concept is (declarative knowledge), how the concept can be applied (procedural knowledge), to what category it may belong (common organizational text pattern), and what are some of its critical attributes (graphic organizer pattern). The advance organizers may be the answer to enhance authentic, active, and dynamic teaching that in retrospect would lead to higher comprehension of complex curriculum content.

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